3CX800A7
Hi - Mu
Power Triode

The 3CX800A7 is a compact power triode intended for use as a cathode-driven Class AB2 or Class B amplifier in rf applications including the VHF band. As a linear amplifier, high power gain may be obtained without sacrifice or low intermodulation distortion characteristics. Low grid interception and high amplification factor combine to make the 3CX800A7 drive power low for a tube of this power capacity. A single 3CX800A7 will deliver 750 watts PEP and 750 watts key-down CW output power to 350 MHz. The 3CX800A7 is useful to 600 MHz. The anode is forced-air cooled for 800 watts of dissipation.

General Characteristics

Electrical

Cathode: Oxide Coated, Unipotential		
Heater Voltage	13.5 +/- 0.6	V
Heater Current, at 13.5 volts	1.5	A
Cathode-Heater Potential (maximum)	+/- 150	V
Minimum Warm-up Time (before application of rf drive and high voltage)	3	Min.
Amplification Factor (approximate)	200	
Direct Interelectrode Capacitance (grid grounded)		
Cin	26.0	pF
Cout	6.1	pF
Cpk	0.05	pF
Highest Frequency for Maximum Ratings	350	MHz

Mechanical

Maximum Overall Dimensions	
Length	2.52 in; 64.01 mm
Diameter	2.53 in; 64.26 mm
Net Weight	11.5 oz. 326 gm
Operating Position	Any

(Revised 10/13/97)

P E N T A   L A B O R A T O R I E S

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Cooling	Forced Air	
Maximum Operating Temperature:		
Ceramic/Metal Seals or Anode Core	250°	C
Base	Large Wafer Elevenar 11 - Pin with Ring	

Absolut Maximum Ratings

(up to 350 MHz)

DC Plate #	2250	Volts
DC Plate Current	0.6	Ampere
Plate Dissipation	800	Watts
Grid Current	0.06	Ampere
Grid Dissipation	4.0	Watts

	CW/SSB	
Plate Voltage	2200	Vdc
Cathode Bias Voltage	+8.2	Vdc
Zero-Signal Plate Current*	15	mAdc
CW Plate Current	500	mAdc
CW Power Input	1100	W
Peak Envelope Power Input	1100	w
Two-Tone Plate Current ^	313	mAdc
CW Grid Current*	36	mAdc
Two-Tone Grid Current*^	16	mAdc
Peak rf Cathode Voltage*	64	v
Peak Driving Power *	23	w
Useful Power Output##	750	W
Useful Power Output, PEP ##	750	w
Cathode Inout Impedance	54	Ohms
Resonant Load Impedance	2700	Ohms
Intermodulation Distortion **		
3rd Order Products	-36	dB
5th Order Products	-32	dB

* - Approximate Value
** - Ref. agaisnt 1 tone of a 2-equal-tone signal
- Plate voltage may rise to 2500 volts maximum under no-signal conditions to account for power supply regulation.
- Measured at the load.
^ - Value will be lower with voice modulation for the same PEP level.

Pulse Modualtor or Regulator

Absolute Maximum Ratings: (See figure 2 Pulse Derating Chart for pulse durations over 100 microseconds)

DC Plate Voltage	3500	Volts
Average Plate Dissipation	800	Watts
Peak Plate Current (average during pulse)	8	Amperes
Average Plate Current	0.6	Ampere
Average Grid Current	0.06	Ampere
Grid Dissipation (avergae)	4	Watts

Typical operation values are obtained by actual measurement or by calculation from published characyeristics cuves. Adjustment of the rf drive voltage to obtain the specified plate current at the specified bias and plate voltage is assumed. If this procedure is followed, there will be little variation in ouput power when the tube is replaced, even though there may be some variation in grid current. The grid current which occurs when the desired plate current is obtained is incidental and may vary from tube to tube. This current variation causes no performance degradation providing the ciruit maintains the correct grid/cathode vooltage in the presence of the current variation.

Application

Mechanical

Mounting and Socketing - The tube may be mounted in any position. If it is to be operated in an inverted (anode down) or horizontal position the SK-1916 clamp assembly should be used for reliable retention. The SK-1906 chimney is provided with four 4-40 tapped holes at one end for chassis mounting and four more 4-40 tapped holes at the other end for optional SK-1916 mounting. The combination of the SK-1906 with the optional SK-1916 clamp makes a rigid mounting assembly for the 3CX800A7. Outline drawings of the SK-1906 air chimney and the clamp assembly are shown in Fig.1.

Cooling - Forced-air cooling must be provided to maintain the anode core and seal temperatures at a safe operating temperature. Cooling data are shown for incoming cooling air at 25°C and 50°C, and represent the minimum requirements to limit tube temperatures to 225°C. The pressure drop figures are approximate and are for the mounting-plate (shown in Fig. 1), socket, tube and chimney combination as would be the case with pressurized-compartment mounting, where air is required to pass through the chassis slots and the anode cooler to the outside of the cabinet. Some air from the pressurized compartment passes by the socket for base cooling. This mounting technique is effective in the HF region but tf leakage through the slots may cause amplifier instability or regenration in the VHF region. Screening the holes or use of "wave-guide-beyond-cutoff" air vents may be required in the VHF region.

Cooling must be applied before or simultaneously with electrode voltages, including the heater, and may be removed simultaneously with them. In all cases temperature of the anode and the ceramic/metal seals is the limiting factor, and the designer is encouraged to use temperature-sensitive paint or other temperature sensing devices in connection with any equipment design before the layout is finalized. It should also be noted it is not good practice to operate at, or close to, the absolute maximum temperature rating for the metal/ceramic seals. Where long life and consistent performance are factors cooling in excess of minimum requirements is normally beneficial.

Electrical

Absolute Maximum Ratings - Values shown for each type of service are based on the "absolute system" and are not to be exceeded under any service conditions. These ratings are limiting values outside which serviceability of the tube may be impaired. In order not to be exceed absolute ratings the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating by a safety factor so the absolute values will never be exceeded under any usual conditions of supply-voltage variation, load variation, or manufacturing variation in the equipment itself. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.

Heater/Cathode Operation - The rated heater voltage for the 3CX800A7 is 13.5 volts, as measured at the base of the tube, and variations should be restricted to plus or minus 0.6 volt for long life and consistent performance.

Cathode Warmup Time - In normal service it is recommended the heater voltage be applied for a minimum of three minutes before anode voltage and rf drive voltage are applied, to allow for proper conditioning if the cathode surface.

High Voltage - Normal operating voltages used with this tube are deadly. The equipment must be designed properly, and operating precautions must be followed. Design all equipment so that no one can come in contact with high voltages. All equipment must include safety enclosures for high-voltage circuits and terminals, with interlock switches to open primary circuits of the power supply and to discharge high-voltage capacitors whenever access doors are opened. Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that high voltage can kill.

Input Circuit - When this tube is operated as a grounded-grid rf amplifier, the use of a resonant tank in the cathode circuit is recommended to obtain greatest linearity and power output. For best results with a single-ended amplifier it is suggested that the cathode tank circuit operate at a "Q" of two or more.

Grid and Plate Current Limitations - Note that grid current is a function of drive power and amplifier loading and can vary widely during tuning and loading. Under no circumstances should grid current exceed 60 mAdc during tuning or operation of the tube.
The maximum plate current rating is 600 mAdc. Drive level should be restricted during tuning periods so this rating is not exceeded. For monitoring purposes, peak meter readings on voice (taking into account inertia of the meter) will be approximately 200 mAdc. Under no circumstances is the plate current meter reading to exceed the maximum plate current rating of 600 mAdc.

Intermodulation Distortion - Typical Operating Conditions, with distortion values included, are the result of data taken during actual operation at 2 MHz. Intermodulation values listed are those measured at the full peak-envelope power noted and are referenced against one tone of a two-equal-tone signal.

Fault Protection - All power tubes at voltages which can cause severe damage in the event of an arc, especially in cases where large amounts of power supply stored energy are involved. Some means of protection is advised in all cases, and it is recommended that a series resistor be used in the lead from the power supply to the anode circuit to limit peak current and help dissipate the energy in the event of a tube or circuit arc. A resistance of 50 ohms, with at least a 25W rating, in the positive plate power supply lead will help protect the tube in the event of an arc.

VHF Operation - The base pin connection to the grid may be used at frequencies to 30 MHz. Above 30 MHz the available contact collects or grid bypass capacitor assembly are recommended. VHF driving power will be greater than the typical values shown on page 2 because of higher circuit losses.

Radio-Frequency Radiation - Exposure to strong rf fields should be avoided, especially at frequencies above 300 MHz, where energy absorption by the human body is significant. The human eye is particularly sensitive. Prolonged exposure to rf radiation should be limited to 10 milliwatts per square centimeter. It is generally accepted that exposure to "high levels" of rf radiation can result in severe injury, including blindness.